

Patent

Customer No.: 31561
Docket No.: 10788-US-PA
Application No.: 10/709,923

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Applicant : Huang et al.

Application No. : 10/709,923

Filed : June 7, 2004

For : FLIP-CHIP PACKAGE SUBSTRATE AND FLIP-CHIP
BONDING PROCESS THEREOF

Art Unit : 2814

Examiner : CHAMBLISS, ALONZO

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OFFICE OF PETITIONS

PETITION FOR REVIVAL OF AN APPLICATION FOR PATENT
ABANDONED UNINTENTIONALLY UNDER 37 CFR 1.137 (b)

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(via fax: 2+3+8 pages)

U.S. Patent and Trademark Office
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Randolph Building
401 Dulany Street
Alexandria, VA 22314

Dear Sir,

This is a petition for revival for the above-identified application which became abandoned due to failure to submit a timely and proper response to an Office Action dated April 26, 2006 unintentionally. Under 37 CFR 1.137(b), Applicants hereby respectfully petition for revival of the above-referenced application.

Attached hereto please find the following items required for a grantable petition as provided in 37 CFR 1.137(b):

(1) Petition fee

Please charge the petition fee in the amount of USD\$1,500 for filing a petition for revival of an unintentionally abandoned application to Account No. 50-2620 (Order no. 10788-US-PA) as set forth in 37 CFR §1.17(m).

(2) Amendment and Response in 8 pages to the Office Action dated April 26, 2006 of the above-identified application.

The response to the above-noted Office Action in 8 pages is enclosed herewith. In addition, a copy of the summary of the original Office Action in 2 pages is as well attached hereto.

Patent

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(3) Statement that the entire delay was unintentional

The entire delay in filing the required reply from the due date for the required reply until the filing of a grantable petition under 37 CFR 1.137(b) was unintentional.

Thank you for your assistance in this regard. Should you need any further information, please feel free to contact the undersigned.

Respectfully Submitted,
JIANQ CHYUN Intellectual Property Office

Date: Jan 10, 2007

By: Belinda Lee
Belinda Lee
Registration No.: 46,863

Please send future correspondence to:

7F. -1, No. 100, Roosevelt Rd.,

Sec. 2, Taipei 100, Taiwan, R.O.C.

Tel: 886-2-2369 2800 Fax: 886-2-2369 7233 / 886-2-2369 7234

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**PETITION FOR REVIVAL OF AN APPLICATION FOR PATENT
ABANDONED UNINTENTIONALLY UNDER 37 CFR 1.137(b)**Docket Number (Optional)
10788-US-PA

First named inventor: Min-Lung Huang

Application No.: 10/709,923

Art Unit: 2814

Filed: 06/07/2004

Examiner: CHAMBLISS, ALONZO

Title: FLIP-CHIP PACKAGE SUBSTRATE AND FLIP-CHIP BONDING PROCESS THEREOF

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OFFICE OF PETITIONSAttention: Office of Petitions
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Commissioner for Patents
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The above-identified application became abandoned for failure to file a timely and proper reply to a notice or action by the United States Patent and Trademark Office. The date of abandonment is the day after the expiration date of the period set for reply in the office notice or action plus an extensions of time actually obtained.

APPLICANT HEREBY PETITIONS FOR REVIVAL OF THIS APPLICATION

NOTE: A grantable petition requires the following items:

- (1) Petition fee;
- (2) Reply and/or issue fee;
- (3) Terminal disclaimer with disclaimer fee - required for all utility and plant applications filed before June 8, 1995; and for all design applications; and
- (4) Statement that the entire delay was unintentional.

1. Petition fee☐ Small entity-fee \$ _____ (37 CFR 1.17(m)). Applicant claims small entity status. See 37 CFR 1.27.☒ Other than small entity - fee \$ 1500 (37 CFR 1.17(m))**2. Reply and/or fee**A. The reply and/or fee to the above-noted Office action in
the form of RESPONSE TO OFFICE ACTION IN 8 PAGES (identify type of reply):☐ has been filed previously on _____
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B. The issue fee and publication fee (if applicable) of \$ _____

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[Page 1 of 2]

This collection of information is required by 37 CFR 1.137(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop Petition, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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3. Terminal disclaimer with disclaimer fee

☐ Since this utility/plant application was filed on or after June 8, 1995, no terminal disclaimer is required.☐ A terminal disclaimer (and disclaimer fee (37 CFR 1.20(d)) of \$ _____ for a small entity or \$ _____ for other than a small entity) disclaiming the required period of time is enclosed herewith (see PTO/SB/63).

4. STATEMENT: The entire delay in filing the required reply from the due date for the required reply until the filing of a grantable petition under 37 CFR 1.137(b) was unintentional. [NOTE: The United States Patent and Trademark Office may require additional information if there is a question as to whether either the abandonment or the delay in filing a petition under 37 CFR 1.137(b) was unintentional (MPEP 711.03(c), subsections (III)(C) and (D)).]

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

Belinda Lee
Signature

Jan. 10, 2007
Date

BELINDA LEE
Typed or printed name

46,863
Registration Number, if applicable

Jianq Chyun Intellectual Property Office
Address

011-886-2-2369-2800
Telephone Number

7th Floor-1, No. 100 Roosevelt Road, Section 2, Taipei, TAIWAN
Address

Enclosures: ☒ Fee Payment☒ Reply☐ Terminal Disclaimer Form☒ Additional sheets containing statements establishing unintentional delay☒ Other: AMENDMENT AND RESPONSE TO OFFICE ACTION IN 8 PAGES

CERTIFICATE OF MAILING OR TRANSMISSION [37 CFR 1.8(a)]

I hereby certify that this correspondence is being:

☐ Deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop Petition, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450.☒ Transmitted by facsimile on the date shown below to the United States Patent and Trademark Office as (571) 273-8300.Dec 26, 2006

Date

Belinda Lee
Signature
BELINDA LEE

Typed or printed name of person signing certificate

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
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8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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Customer No.: 31561

Docket No.: 10788-US-PA

Application No.: 10/709,923

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner: CHAMBLISS, ALONZO

Group Art Unit: 2814

In re PATENT APPLICATION of
Applicants : HUANG et al.

Serial No. : 10/709,923

Filed : June 7, 2004

For : FLIP-CHIP PACKAGE
SUBSTRATE AND FLIP-CHIP
BONDING PROCESS THEREOFAMENDMENT

Attorney Docket: 10788-US-PA

"The Commissioner is authorized to charge the fees indicated in the transmittal letter and any other fees required in connection with the filing of this paper to account No. 50-2620 (Order No.: 10788-US-PA)."

AMENDMENTS AND RESPONSE TO OFFICE ACTION

United States Patent and Trademark Office
Customer Service Window
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Randolph Building
401 Dulany Street
Alexandria, VA 22314

Dear Sir:

The Office Action dated April 26, 2006, has been carefully considered. In response thereto, please enter the following amendments and consider the following remarks.

Customer No.: 31561
Docket No.: 10788-US-PA
Application No.: 10/709,923

AMENDMENTS

In The Claims

Claims 1-5. (cancelled)

6. (currently amended) A flip chip package process, comprising:

providing a substrate having a first surface and an opposite second surface, wherein the substrate includes a plurality of first contacts on the first surface of the substrate and a plurality of second contacts on the second surface of the substrate, and wherein the first contacts are electrically connected to the second contacts;

forming a plurality of bumps on the first surface of the substrate, wherein each bump is connected to one first contact;

providing a chip having a plurality of bonding pads corresponding to the bumps, wherein a metal layer is disposed on surfaces of the bonding pads without having additional bumps thereon;

arranging the chip onto the first surface of the substrate by flipping the chip, so that the bonding pads are connected to the bumps; and

reflowing the bumps.

7. (original) The process of claim 6, further comprising disposing a plurality of solder balls on the second surface of the substrate, wherein the solder balls are connected to the second contacts.

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8. (original) The process of claim 6, further comprising disposing a plurality of pins on the second surface of the substrate, wherein the pins are connected to the second contacts.
9. (original) The process of claim 6, wherein the method for forming the bumps comprises implanting tin globes and treating surfaces of the first contacts with a flux before implanting the tin globes.
10. (currently amended) The process of claim 6, wherein the method for forming the bumps comprises printing a tin paste onto surfaces of the first contacts and reflowing the tin paste.[[.]]
11. (original) The process of claim 6, wherein the method for forming the bumps comprises forming the bumps on surfaces of the first contacts by electroplating, thus forming the bumps on the substrate without reflowing.
12. (original) The process of claim 6, wherein an adhesive layer is formed on the surfaces of the bonding pads of the chip before the chip is arranged to the substrate, and wherein after the chip is arranged to the substrate, the adhesive layer wraps around the bumps.
13. (original) The process of claim 6, further comprising filling an underfill material between the chip and the substrate, wherein the underfill material covers the bumps.
14. (original) The process of claim 6, wherein the metal layer is a nickel layer formed by electroless plating.

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REMARKS

Present Status of the Application

Present pending claims 6-14 are rejected. Specifically, claims 6-8, 10, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Asai et al. (U. S. Patent 6,534,723; hereinafter Asai) in view of Sakuyama et al. (U. S. Patent 6,689,639; hereinafter Sakuyama). In addition, claim 9 is rejected under 35 U. S. C. 103(a) as being unpatentable over Asai in view of Sakuyama and further in view of Acocella et al. (U. S. Patent 5,591,941; hereinafter Acocella). Claim 11 is rejected under 35 U. S. C. 103(a) as being unpatentable over Asai in view of Sakuyama and further in view of Gansauge et al. (U. S. Patent 5,244,833; hereinafter Gansauge). Claim 12 is rejected under 35 U. S. C. 103(a) as being unpatentable over Asai in view of Sakuyama and in view of Benwnati et al. (U. S. Patent 6,177,729; hereinafter Benenati). Applicants have amended claim 1 and claim 10 to improve clarity and correct typographic error. After entry of amendments, claims 6-14 remain pending in the present application, and reconsideration of those claims is respectfully requested.

Discussion of Claim Rejections under 35 USC 103

1. Claims 6-8, 10, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Asai in view of Sakuyama. Claim 9 is rejected under 35 U. S. C. 103(a) as being unpatentable over Asai in view of Sakuyama and further in view of Acocella. Claim 11 is rejected under 35 U. S. C. 103(a) as being unpatentable over Asai in view of Sakuyama and further in view of Gansauge. Claim 12 is rejected under 35 U. S. C. 103(a) as being unpatentable over Asai in view of Sakuyama and Benwnati. Applicants respectfully traverse

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the rejections for at least the reasons set forth below.

2. With respect to independent claim 6, as stated in previous response, *the bump 226 are formed on the contact 210 of the substrate 200 but not over the bonding pad 222 and the metal layer 224 of the chip 220*. In other words, the bump is formed on the substrate but not on the chip with the at least the advantages of low-cost (par. [0029]). Independent claim 6 has clearly recited that *the bumps are formed on the substrate but not on the chip*. The bonding pads of the chip are then connected to the bumps by flip-chip manner.

Dependent claims 7-14 also include the foregoing features.

3. In re Asai, as shown in FIGs. 8, 10, and 11, the electronic component 82, such as LST chip (col. 19, line 9), has been formed with the solder bumps (solder ball 84) while the solder bumps 62, 96 are also formed on the circuit board (col. 5, lines 16-21; col. 26, lines 40; Fig. 18).

In other words, Asai specifically requires the solder bump 84 be formed on the chip. However, this solder bump 84 on the chip 82 is not necessary in the present invention, so as to reduce the cost.

4. In re Sakuyama, as shown in Fig. 3C and Fig. 5, clearly the bump 41 is formed on the chip X, and then the chip X is connected to the wiring board 70 (col. 10, lines 27-29). Therefore, Sakuyama failed to disclose the emphasized feature recited in claim 6.

Further, the electrode 11 is a part of the semiconductor device X (chip) for forming the bumps thereon. The electrode 71 is formed on the wiring board only at one surface.

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5. With respect to claims 6-8, 10, 13, and 14, Asai and Sakuyama either alone or in combination failed to disclose the features as recited in independent claim 6. With at least the same foregoing reasons, Asai with Sakuyama failed to disclose the features recited in dependent claims 7-8, 10, 13, and 14.

6. With respect to claim 9, the Office Action further cites Acocella in combination with Asai and Sakuyama for rejections. Applicants respectfully disagree.

In re Acocella, the Office Action cites Acocella about implanting tin globes and treating surface of the first contact with a flux before implanting the tin globes. However, the bumps 18 are formed on the substrate 10 of chip in Acocella. Therefore, Acocella does not provide the missing features of Asai with Sakuyama in the parent independent claim 6. Claim 9 is therefore allowable for at least the same reasons.

7. With respect to claim 11, the Office Action further cites Gansauge in combination with Asai and Sakuyama for rejections. Applicants respectfully disagree.

In re Gansauge, again in Fig. 6, the bumps 34 and 36 are formed on the silicon substrate 10 (col. 65; lines 7-8). The chip connection terminals 28 are formed above the contact pads 14. Likewise, Gansauge does not provide the missing features of Asai with Sakuyama in the parent independent claim 6. Dependent claim 11 is therefore allowable for at least the same reasons.

8. With respect to claim 12, the Office Action further cites Benenati in combination with Asai and Sakuyama for rejections. Applicants respectfully disagree.

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In re Benenati, the rolling ball connector is disclosed. However, Benenati does not disclose that the bumps are formed on the substrate as recited in independent claim 6. Indeed, as shown in Fig. 4c and Fig. 5b of Benenati, the ball 20 is formed on the chip 26. Benenati failed to provide the missing features of Asai with Sakuyama in the parent independent claim 6.

For at least the foregoing reasons, Applicants respectfully submit that independent claim 6 patently defines over the prior art references, and should be allowed. For at least the same reasons, dependent claims 7-14 patently define over the prior art references as well.

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CONCLUSION

For at least the foregoing reasons, it is believed that all the pending claims 6-14 of the invention patently define over the prior art and are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

Respectfully submitted,

Date :

Jan. 10, 2007

Belinda Lee
Belinda Lee

Registration No.: 46,863

Jianq Chyun Intellectual Property Office
7th Floor-1, No. 100
Roosevelt Road, Section 2
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Patent

Customer No.: 31561

Docket No.: 10788-US-PA

Application No.: 10/709,923

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Applicant : Huang et al.

Application No. : 10/709,923

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Respectfully Submitted,
JIANQ CHYUN Intellectual Property Office

Date: Jan. 10, 2007By: Belinda Lee
Belinda Lee
Registration No.: 46,863**Please send future correspondence to:**

7F. -1, No. 100, Roosevelt Rd.,

Sec. 2, Taipei 100, Taiwan, R.O.C.

Tel: 886-2-2369 2800 Fax: 886-2-2369 7233 / 886-2-2369 7234

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Docket Number (Optional)
 10788-US-PA

First named inventor: Min-Lung Huang

Application No.: 10/709,923

Art Unit: 2814

Filed: 06/07/2004

Examiner: CHAMBLISS, ALONZO

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1. Petition fee

☐ Small entity-fee \$ _____ (37 CFR 1.17(m)). Applicant claims small entity status. See 37 CFR 1.27.

☒ Other than small entity - fee \$ 1500 (37 CFR 1.17(m))

2. Reply and/or fee

A. The reply and/or fee to the above-noted Office action in
 the form of RESPONSE TO OFFICE ACTION IN 8 PAGES

(identify type of reply):

01/10/2007 WED 04:33 [TX/RX NO 6340] 005

☐ has been filed previously on _____
☒ is enclosed herewith.

B. The issue fee and publication fee (if applicable) of \$ _____
☐ has been paid previously on _____
☐ is enclosed herewith.

[Page 1 of 2]

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- ☐ Since this utility/plant application was filed on or after June 8, 1995, no terminal disclaimer is required.
- ☐ A terminal disclaimer (and disclaimer fee (37 CFR 1.20(d)) of \$ _____ for a small entity or \$ _____ for other than a small entity) disclaiming the required period of time is enclosed herewith (see PTO/SB/63).

4. STATEMENT: The entire delay in filing the required reply from the due date for the required reply until the filing of a grantable petition under 37 CFR 1.137(b) was unintentional. [NOTE: The United States Patent and Trademark Office may require additional information if there is a question as to whether either the abandonment or the delay in filing a petition under 37 CFR 1.137(b) was unintentional (MPEP 711.03(c), subsections (III)(C) and (D)).]

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

Belinda Lee
Signature

Jan. 10, 2007
Date

BELINDA LEE
Typed or printed name

46,863
Registration Number, if applicable

Jianq Chyun Intellectual Property Office
Address

011-886-2-2369-2800
Telephone Number

7th Floor-1, No. 100 Roosevelt Road, Section 2, Taipei, TAIWAN
Address

Enclosures: ☒ Fee Payment☒ Reply☐ Terminal Disclaimer Form☒ Additional sheets containing statements establishing unintentional delay☒ Other: AMENDMENT AND RESPONSE TO OFFICE ACTION IN 8 PAGES

CERTIFICATE OF MAILING OR TRANSMISSION [37 CFR 1.8(a)]

I hereby certify that this correspondence is being:

- ☐ Deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop Petition, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450.
- ☒ Transmitted by facsimile on the date shown below to the United States Patent and Trademark Office as (571) 273-8300.

Dec 26, 2006

Date

Belinda Lee

Signature

BELINDA LEE

Typed or printed name of person signing certificate

[Page 2 of 2]

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 C.F.R. 1.44, as a routine use, to the public if the record was filed in an application which

became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.

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OFFICE OF PETITIONS

Customer No.: 31561
Docket No.: 10788-US-PA
Application No.: 10/709,923

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner: CHAMBLISS, ALONZO

Group Art Unit: 2814

In re PATENT APPLICATION of
Applicants : HUANG et al.

Serial No. : 10/709,923

Filed : June 7, 2004

For : FLIP-CHIP PACKAGE
SUBSTRATE AND FLIP-CHIP
BONDING PROCESS THEREOF

AMENDMENT

Attorney Docket: 10788-US-PA

"The Commissioner is authorized to charge the fees indicated in the transmittal letter and any other fees required in connection with the filing of this paper to account No. 50-2620 (Order No.: 10788-US-PA)."

AMENDMENTS AND RESPONSE TO OFFICE ACTION

United States Patent and Trademark Office
Customer Service Window
Mail Stop Amendment
Randolph Building
401 Dulany Street
Alexandria, VA 22314

-----▽-----▽-----▽-----▽-----▽-----▽-----
Dear Sir:

The Office Action dated April 26, 2006, has been carefully considered. In response thereto, please enter the following amendments and consider the following remarks.

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Customer No.: 31561
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AMENDMENTS**In The Claims****Claims 1-5. (cancelled)**

6. (currently amended) A flip chip package process, comprising:

providing a substrate having a first surface and an opposite second surface, wherein the substrate includes a plurality of first contacts on the first surface of the substrate and a plurality of second contacts on the second surface of the substrate, and wherein the first contacts are electrically connected to the second contacts;

forming a plurality of bumps on the first surface of the substrate, wherein each bump is connected to one first contact;

providing a chip having a plurality of bonding pads corresponding to the bumps, wherein a metal layer is disposed on surfaces of the bonding pads without having additional bumps thereon;

arranging the chip onto the first surface of the substrate by flipping the chip, so that the

-----▽-----▽-----▽-----▽-----▽-----▽-----
bonding pads are connected to the bumps; and

reflowing the bumps.

7. (original) The process of claim 6, further comprising disposing a plurality of solder balls on the second surface of the substrate, wherein the solder balls are connected to the second contacts.

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8. (original) The process of claim 6, further comprising disposing a plurality of pins on the second surface of the substrate, wherein the pins are connected to the second contacts.

9. (original) The process of claim 6, wherein the method for forming the bumps comprises implanting tin globes and treating surfaces of the first contacts with a flux before implanting the tin globes.

10. (currently amended) The process of claim 6, wherein the method for forming the bumps comprises printing a tin paste onto surfaces of the first contacts and reflowing the tin paste.[[.]]

11. (original) The process of claim 6, wherein the method for forming the bumps comprises forming the bumps on surfaces of the first contacts by electroplating, thus forming the bumps on the substrate without reflowing.

12. (original) The process of claim 6, wherein an adhesive layer is formed on the surfaces of the bonding pads of the chip before the chip is arranged to the substrate, and wherein after the chip is arranged to the substrate, the adhesive layer wraps around the bumps.

13. (original) The process of claim 6, further comprising filling an underfill material

wherein the underfill material covers the bumps.

14. (original) The process of claim 6, wherein the metal layer is a nickel layer formed by electroless plating.

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REMARKS

Present Status of the Application

Present pending claims 6-14 are rejected. Specifically, claims 6-8, 10, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Asai et al. (U. S. Patent 6,534,723; hereinafter Asai) in view of Sakuyama et al. (U. S. Patent 6,689,639; hereinafter Sakuyama). In addition, claim 9 is rejected under 35 U. S. C. 103(a) as being unpatentable over Asai in view of Sakuyama and further in view of Acocella et al. (U. S. Patent 5,591,941; hereinafter Acocella). Claim 11 is rejected under 35 U. S. C. 103(a) as being unpatentable over Asai in view of Sakuyama and further in view of Gansauge et al. (U. S. Patent 5,244,833; hereinafter Gansauge). Claim 12 is rejected under 35 U. S. C. 103(a) as being unpatentable over Asai in view of Sakuyama and in view of Benwnati et al. (U. S. Patent 6,177,729; hereinafter Benenati). Applicants have amended claim 1 and claim 10 to improve clarity and correct typographic error. After entry of amendments, claims 6-14 remain pending in the present application, and reconsideration of those claims is respectfully requested.

Discussion of Claim Rejections under 35 USC 103

1. Claims 6-8, 10, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Asai in view of Sakuyama. Claim 9 is rejected under 35 U. S. C. 103(a) as being unpatentable over Asai in view of Sakuyama and further in view of Acocella. Claim 11 is rejected under 35 U. S. C. 103(a) as being unpatentable over Asai in view of Sakuyama and further in view of Gansauge. Claim 12 is rejected under 35 U. S. C. 103(a) as being unpatentable over Asai in view of Sakuyama and Benwnati. Applicants respectfully traverse

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the rejections for at least the reasons set forth below.

2. With respect to independent claim 6, as stated in previous response, *the bump 226 are formed on the contact 210 of the substrate 200 but not over the bonding pad 222 and the metal layer 224 of the chip 220.* In other words, the bump is formed on the substrate but not on the chip with the at least the advantages of low-cost (par. [0029]). Independent claim 6 has clearly recited that *the bumps are formed on the substrate but not on the chip.* The bonding pads of the chip are then connected to the bumps by flip-chip manner.

Dependent claims 7-14 also include the foregoing features.

3. In re Asai, as shown in FIGs. 8, 10, and 11, the electronic component 82, such as LST chip (col. 19, line 9), has been formed with the solder bumps (solder ball 84) while the solder bumps 62, 96 are also formed on the circuit board (col. 5, lines 16-21; col. 26, lines 40; Fig. 18).

In other words, Asai specifically requires the solder bump 84 be formed on the chip. However, this solder bump 84 on the chip 82 is not necessary in the present invention, so as to reduce the cost.

4. In re Sakuyama, as shown in Fig. 3C and Fig. 5, clearly the bump 41 is formed on the chip X, and then the chip X is connected to the wiring board 70 (col. 10, lines 27-29). Therefore, Sakuyama failed to disclose the emphasized feature recited in claim 6.

Further, the electrode 11 is a part of the semiconductor device X (chip) for forming the bumps thereon. The electrode 71 is formed on the wiring board only at one surface.

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5. With respect to claims 6-8, 10, 13, and 14, Asai and Sakuyama either alone or in combination failed to disclose the features as recited in independent claim 6. With at least the same foregoing reasons, Asai with Sakuyama failed to disclose the features recited in dependent claims 7-8, 10, 13, and 14.

6. With respect to claim 9, the Office Action further cites Acocella in combination with Asai and Sakuyama for rejections. Applicants respectfully disagree.

In re Acocella, the Office Action cites Acocella about implanting tin globes and treating surface of the first contact with a flux before implanting the tin globes. However, the bumps 18 are formed on the substrate 10 of chip in Acocella. Therefore, Acocella does not provide the missing features of Asai with Sakuyama in the parent independent claim 6. Claim 9 is therefore allowable for at least the same reasons.

7. With respect to claim 11, the Office Action further cites Gansauge in combination with Asai and Sakuyama for rejections. Applicants respectfully disagree.

In re Gansauge, again in Fig. 6, the bumps 34 and 36 are formed on the silicon substrate 10 (col. 65, lines 7-8). The chip connection terminals 28 are formed above the contact pads 14. Likewise, Gansauge does not provide the missing features of Asai with Sakuyama in the parent independent claim 6. Dependent claim 11 is therefore allowable for at least the same reasons.

8. With respect to claim 12, the Office Action further cites Benenati in combination with Asai and Sakuyama for rejections. Applicants respectfully disagree.

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In re Benenati, the rolling ball connector is disclosed. However, Benenati does not disclose that the bumps are formed on the substrate as recited in independent claim 6. Indeed, as shown in Fig. 4c and Fig. 5b of Benenati, the ball 20 is formed on the chip 26. Benenati failed to provide the missing features of Asai with Sakuyama in the parent independent claim 6.

For at least the foregoing reasons, Applicants respectfully submit that independent claim 6 patentably defines over the prior art references, and should be allowed. For at least the same reasons, dependent claims 7-14 patentably define over the prior art references as well.

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CONCLUSION

For at least the foregoing reasons, it is believed that all the pending claims 6-14 of the invention patently define over the prior art and are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

Respectfully submitted,

Date :

Jan. 10, 2007

Belinda Lee

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